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ORGANOMINERAL FERTILIZER AND ITS MANUFACTURING PROCEDURE

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List of documents cited
in the preliminary search report: Refer to the end of the present section

[Abstract]

The invention concerns a manufacturing procedure of an organomineral fertilizer of the type consisting in making a first mixture of the mineral elements (1, 3) making up the composition of a mineral fertilizer, in making a second mixture of organic elements (7, 9) entering into the composition of an organic fertilizer, in mixing the first and second mixture and in blending the paste obtained in a blender (13), characterized in that the following steps are carried out, consisting in:

a) carrying out granulation of the paste obtained

b) cooking the granules (17) obtained in a furnace (19) without destroying the organic elements, and recovering the vapor released from the cooking furnace, cooling it to liquefy it and sending it into the blender (13), and

c) rapidly cooling the cooked granules.

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* [Editor's note: International Classification numbers and Filing Date not provided in the original document.]

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The invention concerns an organomineral fertilizer and its manufacturing method.

Plants use nutritive elements for their growth which are captured through their leaves during photosynthesis (that is the case with carbon) and essentially by the roots for the other elements. The elements that plants must draw from the soil, especially nitrogen, potassium and phosphorus are often present in insufficient amounts to meet the needs of the plants. The use of fertilizer therefore makes it possible to greatly increase the yields.

Nitrogen (N), phosphate (P) or potassium (K) mineral fertilizers are already known and are called NPK fertilizers. These fertilizers currently sold on the market are proportioned correctly so that after leaching with rain, sufficient nitrogen, phosphate and potassium remain near the roots of the treated plants. This causes overdosing and dispersion of nitrogen, phosphate and potassium in groundwater and streams.

Organic fertilizers are also known which are based on waste materials originating from farming (liquid manure), treatment plants (residual sludge) and the food-processing industry (washing slurries from slaughterhouses and canneries). These organic fertilizers also contain nitrogen (N), phosphate (P) and potassium (K) as well as oligoelements but are especially used today to improve physical qualities of the soil (organic enrichment). However, after spreading, it is imperative that these organic fertilizers be buried to limit the odors and the loss of ammoniacal nitrogen. Moreover, when the liquid manure is spread by irrigation, it must necessarily be deodorized. Furthermore, 20-30 tonnes liquid manure per hectare are frequently spread, representing 100-150 units of nitrogen, 80-120 units of phosphorus and 60-90 units of potassium, while the needs of the plants are 40% lower. Therefore, there are problems with pollution of the environment resulting from such spreading.

Finally, blended fertilizers are known and formed from a mixture of organic and mineral matter which are not antagonists but on the contrary, are complementary. These organomineral fertilizers enable the spreading of nutritive elements at one time and which originate from mineral and organic sources, elements that the plants could absorb over three to four months.

A manufacturing procedure of these organomineral fertilizers is already known from the prior art consisting in making a first mixture of different mineral substances, then in adding organic materials of the liquid manure, straw or manure type to it, in grinding and mixing the entire amount, then in pressing the mixture obtained in an automatic press to obtain fertilizer bundles 7-8 mm in length. This procedure is carried out with organic and mineral mixtures in the dry state or optionally, in the presence of vapor.

This manufacturing procedure however, presents the serious drawback of causing the emission of polluting vapors, especially ammonia vapors. In addition, the fertilizer bundles are not as easy to spread as the granules of mineral fertilizers that already exist and require the use of a specific spreading material.

The goal of the invention is to resolve the drawbacks of the prior art.

This goal is reached with the aid of a manufacturing procedure of the type consisting in making a first mixture of mineral elements making up the composition of a mineral fertilizer, in making a second mixture of organic elements making up the composition of an organic fertilizer, in mixing the first and second mixture and in blending the paste obtained in a blender. According to the characteristics of the procedure, the following additional steps are carried out, consisting in:

a) carrying out granulation of the paste obtained

b) cooking the granules obtained in the furnace without destroying the organic elements, and recovering the vapor released from the cooking furnace, cooling it to liquefy it and sending it into the blender, and

c) cooling the cooked granules rapidly.

Because of the characteristics of the invention, the ammonia vapors circulate in the closed system and there is no pollution of the atmosphere.

Preferably, the granulation is carried out in a granulator, so as to obtain granules of approximately 2-3 mm. The organomineral fertilizer granules are easier to spread than the bundles of these same fertilizers of the prior art and especially can be done with the agricultural machine that the users already have for spreading granules of mineral fertilizers of the prior art. The solution of the invention is therefore less expensive.

Preferably the cooking is carried out at a temperature between 200°C and 380°C for a period of time less than or equal to 80 sec. Thus, the fertilizers made do not include any microbes. They can be put on the pasture where animals are going to graze.

Another goal of the invention is also to manufacture a "biological" fertilizer. This goal is reached with the aid of an organomineral fertilizer made according to the procedure described above, said fertilizer containing between 5 and 50 wt% of organic elements. Thus, since the

proportion of NPK supplied by elements of organic origin is high, the final cost of the fertilizer is reduced significantly (up to approximately 30%).

The invention will be better understood by reading the following description of one method of embodiment of the invention, given by way of illustrative and nonlimiting example, this description being made by making reference to the attached figure in which:

-Figure 1 is a diagram illustrating the different successive steps of the manufacturing procedure of the fertilizer.

As illustrated in Figure 1, the procedure consists of a first step consisting in making a first mixture of mineral elements 1,3 making up the composition of a mineral fertilizer, with the aid of a mixer 5. These mineral elements are generally in powder form. The first mixture contains for example at least one of the following elements: phosphate, magnesium hydroxide (magnesia), tricalcium phosphate (lime), dolomite, potassium chloride (KCl), ammonium sulfate, or maerl. This type of mixture was already known for the manufacture of mineral fertilizers. Maerl is formed by the fossilization of a marine alga called *Lithothamnion calcareum* and composed of 70-80% $CaCO_3$ and $MgCO_3$. Beside the calcium and magnesium, this element provides many oligoelements, in particular iodine.

The mixture of mineral elements is carried out dry and at ambient temperature. Approximately 4 min is needed to mix 2 tonnes of components.

A second step consists in making a second mixture of organic elements 7, 9 with the aid of a mixer 11. This second mixture is made at ambient temperature by fractionating the organic waste materials. The second mixture contains for example, sludge from treatment plants or liquid manure. When the organic mixture contains only sludge from treatment plants and liquid manure, it contains preferably 10-400 kg sludge from treatment plants and 80-900 L liquid manure.

The liquid manure is a mixture of urine and feces from hogs or cattle derived from being reared on slatted floors. It is more or less diluted by wash water and watering. The average mineral composition of the liquid manure from hogs is the following in grams per kilo of liquid manure:

$N = 5$

$P_2O_5 = 4$

$K_2O = 3$

$CaO = 3$

$MgO = 1$

Nitrogen is present mainly in the form of ammonia and is derived from the transformation of urea in the urine.

The third step consists in mixing the first and the second mixture and in introducing the paste obtained into a blender 13. Advantageously, the blending is carried out at ambient temperature. By way of example, it is carried out for approximately 11 sec in an in-line blender.

The fourth step consists in carrying out granulation of the paste from the blender in a granulator 15. The granulator 15 has a granulation disk 16 enabling the formation of granules. The granules 17 obtained are introduced into a furnace 19 where they are cooked according to a temperature and time period dependent on the furnace used while not exceeding a temperature that would risk destroying the fertilizing organic material. This cooking temperature is at minimum approximately 200°C and at maximum approximately 380°C, and preferably between 200 and 250°C. The cooking time is in general at maximum 80 sec.

The ammonia vapors 20 derived from the furnace 19 are recycled in the blender 13.

The optional sixth sieving step is in a sieve 21 that makes it possible to remove particulate fines 23 the size of which makes them inappropriate for use as fertilizer granules. These particulate fines 23 are advantageously recycled towards blender 13, which limits the formation of dust around the apparatus.

Finally, the last step consists in sending granules, whose dimensions correspond to the proposed application, into a silo 25 equipped with vertical aeration ramps 27 enabling the cooling of the granules with a single blast. By way of example, a stainless steel silo is used which is 3 mm in diameter and 8 mm in height, provided with 15 vertical aeration ramps uniformly distributed on the periphery of the silo and one that is arranged in the center of the silo. The aeration is carried out by an air turbocooler.

Cooling is carried out very rapidly in order to maintain the hardness of the granules. In fact, if the cooling is too slow, they have a tendency to disaggregate. The granules thus go from 90 °C to 10 °C in approximately 30 min.

The invention also concerns the fertilizer obtained by such a procedure. This fertilizer contains preferentially between 5 and 50% organic elements. Advantageously, it is present in the form of granules of approximately 2-3 mm in length.

Hereinafter is given an embodiment example of a fertilizer according to the invention.

Example 1

A 900-kg mineral mixture is made containing the following elements:

Ammonium sulfate	238 kg
Phosphorus	233 kg
Potash	167 kg
Maerl	262 kg

This mixture corresponds to the following percentages of the different components:

SO_4	5%	K_2O	10%

P_2O_5 7% CaO 11.53%

An organic mixture is made from 150 kg of sludge from a treatment plant and 300 L liquid manure.

After mixing, blending and granulation, the granules are cooked in the furnace at 250°C for 80 sec. After sieving the cooked granules, the granules are cooled in the silo by making them go from 90°C to 10°C in 30 min.

The product obtained is present in the form of granules 2-3 mm in length.

Claims

1. Procedure for manufacturing an organomineral fertilizer of the type consisting in making a first mixture of the mineral elements (1, 3) making up the composition of a mineral fertilizer, in making a second mixture of organic elements (7, 9) making up the composition of an organic fertilizer, in mixing the first and second mixtures and in blending the paste obtained in a blender (13), characterized in that the following steps are carried out, consisting in:

a) carrying out granulation of the paste obtained

b) cooking the granules (17) obtained in the furnace (19) without destroying the organic elements, and recovering the vapor released from the cooking furnace, cooling it to liquefy it and sending it into the blender (13), and

c) rapidly cooling the cooked granules.

2. Procedure for manufacturing an organomineral fertilizer according to Claim 1, characterized in that the granulation is carried out in a granulator (15) so as to obtain granules (17) with a dimension of 2-3 mm.

3. Procedure for manufacturing an organomineral fertilizer according to Claim 1, characterized in that the cooking is carried out at a temperature between 200°C and 380°C for a period less than or equal to 80 sec.

4. Procedure for manufacturing an organomineral fertilizer according to Claim 1, characterized in that the cooling is carried out in a silo (25) equipped with aeration ramps (27) enabling cooling of the cooked granules suddenly from approximately 90°C to approximately 10°C.

5. Procedure for manufacturing an organomineral fertilizer according to Claim 1, characterized in that it consists of the additional step carried out between steps b) and c) consisting in classifying the granules by sieving.

6. Procedure for manufacturing an organomineral fertilizer according to Claim 1, characterized in that the first mixture of mineral elements contains at least one of the following elements: phosphate, magnesium hydroxide, tricalcium phosphate, dolomite, potassium chloride, ammonium sulfate or maerl.

7. Procedure for manufacturing an organomineral fertilizer according to Claim 1, characterized in that the second mixture of organic elements contains at least one of the following elements: sludge from treatment plants or liquid manure.

8. Organomineral fertilizer obtained as a result of the procedure according to one of Claims 1-9, characterized in that it contains approximately 5-50% organic elements.

9. Organomineral fertilizer according to Claim 8, characterized in that it is present in the form of granules (17) approximately 2-3 mm in length.

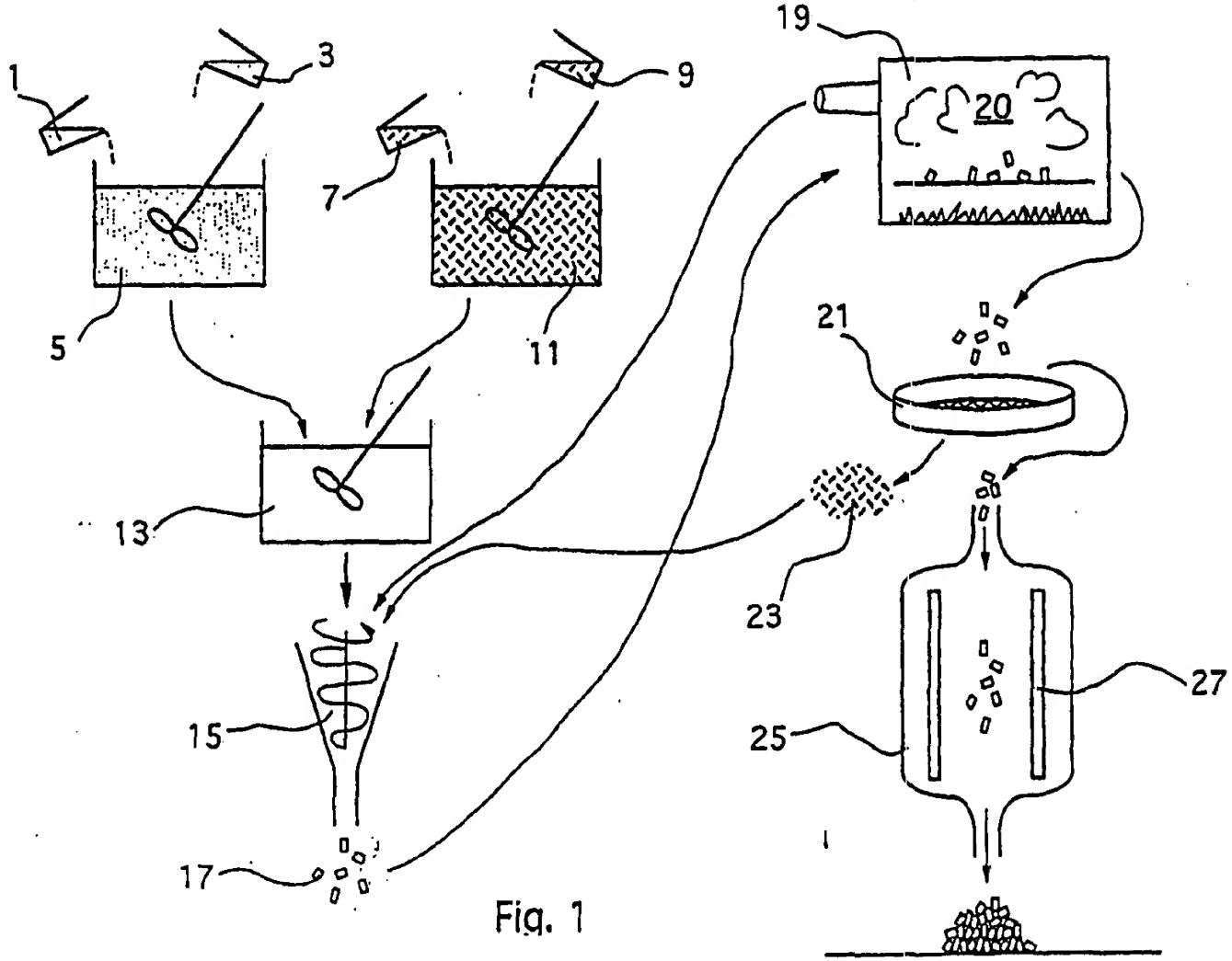

Fig. 1

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SEARCH REPORT
established on the basis of the most recent claims
filed before the start of the search

Application Number
FA 537754
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DOCUMENTS CONSIDERED TO BE RELEVANT		Claims concerned in the examined document	
Category	Citation of document with indication where appropriate, of relevant passages		
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Date of completion of the search	Examiner
August 13, 1997	RODRIGUEZ FONTAO, M

CATEGORY OF CITED DOCUMENTS

X: Particularly relevant if taken alone.
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SEARCH REPORT

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